

CLAIM AMENDMENTS

1. (Currently Amended) A transverse ~~type~~ induction heating apparatus ~~in which~~ comprising:

inductors including iron cores and coils wound around the iron cores ~~are disposed~~ between a rough rolling mill and a finish rolling mill of a steel hot-rolling line ~~so as to be~~, opposite to each other across a material to be rolled; and ~~the material to be rolled, which is~~ conveyed by a conveying roll, is the material being heated by the inductors to which electric power is supplied from an AC power source, the transverse type induction heating apparatus being characterized in that wherein,

iron core widths of the inductors in a plate width direction of the material to be rolled are ~~made~~ smaller than ~~a~~ the plate width of the material to be rolled,

~~they~~ the inductors are disposed on a plate width center line of the material to be rolled, and,

when ~~a~~ current penetration depth is ~~made~~  $\delta$  (m), ~~a~~ specific resistance of the material to be rolled is ~~made~~  $\rho$  ( $\Omega$ -m), ~~a~~ magnetic permeability of the material to be rolled is ~~made~~  $\mu$  (H/m), ~~a~~ heating frequency of the AC power source is ~~made~~  $f$  (Hz), ~~a circular constant is made~~  $\pi$ , and ~~a~~ plate thickness of the material to be rolled is ~~made~~  $tw$  (m),

~~the heating frequency of the AC power source is set to cause the current penetration depth  $\delta$  of expression (1) set forth below to satisfy expression (2) set forth below~~

$$\delta = \sqrt{\frac{\rho}{\mu \cdot f \cdot \pi}} \quad \text{---(1)}$$

$$\frac{tw}{\delta} < 0.95 \quad \text{---(2).}$$

2. (Currently Amended) ~~A~~ The transverse ~~type~~ induction heating apparatus according to claim 1, ~~characterized in that wherein the inductor includes~~ inductors include plural magnetic poles.

3. (Currently Amended) ~~A~~ The transverse ~~type~~ induction heating apparatus according to claim 1 ~~or 2, characterized in that the~~ wherein respective coils are connected in series to each other.

4. (Currently Amended) ~~A~~ The transverse ~~type~~ induction heating apparatus according to ~~any one of claims claim 1 to 3, characterized in that the~~ wherein respective inductors can

be moved in a plate thickness direction of the material to be rolled by lifting and lowering means.

5. (Currently Amended) ~~A~~ The transverse type induction heating apparatus according to any one of claims 1 to 4 claim 1, characterized in that including at least two pairs of the inductors ~~are~~ disposed in a traveling direction of the material to be rolled, ~~and wherein~~ the conveying roll is disposed between the inductors.

6. (Currently Amended) ~~A~~ The transverse type induction heating apparatus according to claim 5, characterized in that wherein the iron core of each of the inductors is disposed on the plate width center line of the material to be rolled.

7. (Currently Amended) ~~A~~ The transverse type induction heating apparatus according to claim 5, characterized in that wherein a surface of the conveying roll is coated with an ~~electrical~~ electrically insulating member.

8. (Currently Amended) A transverse ~~type~~ induction heating apparatus according to claim 1, ~~characterized in that wherein~~ the ~~plural~~ inductors are disposed from an upstream side to a downstream side of the steel hot-rolling line, the AC power sources are individually connected to the respective inductors, and, when heating frequencies of the AC power sources are ~~made~~  $F_1, F_2, \dots, F_n$  from an upstream side of the steel hot-rolling line, and ~~K is made~~  $K = 1.05$  to  $1.20$ , the heating frequencies of the respective AC power sources ~~are set to satisfy a relation of expression (3) set forth below~~

$$F_1 > F_2 \times K > \dots > F_n \times K^{n-1} \quad \text{---(3).}$$

9. (New) The transverse induction heating apparatus according to claim 2, wherein respective coils are connected in series to each other.

10. (New) The transverse induction heating apparatus according to claim 2, wherein respective inductors can be moved in a plate thickness direction of the material to be rolled by lifting and lowering means.

11. (New) The transverse induction heating apparatus according to claim 3, wherein respective inductors can be moved in a plate thickness direction of the material to be rolled by lifting and lowering means.

12. (New) The transverse induction heating apparatus according to claim 2, including at least two pairs of the inductors disposed in a traveling direction of the material to be rolled, wherein the conveying roll is disposed between the inductors.

13. (New) The transverse induction heating apparatus according to claim 3, including at least two pairs of the inductors disposed in a traveling direction of the material to be rolled, wherein the conveying roll is disposed between the inductors.

14. (New) The transverse induction heating apparatus according to claim 4, including at least two pairs of the inductors disposed in a traveling direction of the material to be rolled, wherein the conveying roll is disposed between the inductors.

15. (New) The transverse induction heating apparatus according to claim 9, including at least two pairs of the inductors disposed in a traveling direction of the material to be rolled, wherein the conveying roll is disposed between the inductors.

16. (New) The transverse induction heating apparatus according to claim 10, including at least two pairs of the inductors disposed in a traveling direction of the material to be rolled, wherein the conveying roll is disposed between the inductors.

17. (New) The transverse induction heating apparatus according to claim 12, wherein the iron core of each of the inductors is disposed on the plate width center line of the material to be rolled.

18. (New) The transverse induction heating apparatus according to claim 12, wherein a surface of the conveying roll is coated with an electrically insulating member.

19. (New) The transverse induction heating apparatus according to claim 13, wherein a surface of the conveying roll is coated with an electrically insulating member.

20. (New) The transverse induction heating apparatus according to claim 5, wherein a surface of the conveying roll is coated with an electrically insulating member.